

LISTS OF SPECIES

Herpetofauna, Santa Edwiges I and II hydroelectric power plants, state of Goiás, Brazil

Carlos Eduardo Domingos Cintra¹
Hélder Lúcio Rodrigues Silva^{1,2}
Nelson Jorge da Silva Jr.^{1,3}

¹ *Systema Naturae Consultoria Ambiental Ltda.*
Rua 58, nº 217, Jardim Goiás. CEP 74810-250. Goiânia, GO, Brazil. Email: herp@terra.com.br

² *Universidade Católica de Goiás, Departamento de Biologia, Centro de Estudos e Pesquisas Biológicas.*
Avenida Universitária, 1440, Setor Universitário. CEP 74605-010. Goiânia, GO, Brazil.

³ *Universidade Católica de Goiás. Mestrado em Ciências Ambientais e Saúde.*
Rua 232, nº 128, 3º andar, Área V, Setor Universitário. CEP 74605-140. Goiânia, GO, Brazil.

Abstract

This paper presents a check list of amphibians and reptiles of the area under the influence of Santa Edwiges I and II small hydroelectric power plants on Rio Buritis, state of Goiás, Brazil. The list was the result of faunal rescue operations carried out between 31 August and 29 September 2005 (Santa Edwiges II) and between 30 July and 12 September 2006 (Santa Edwiges I). The list comprises 30 species of amphibians belonging to 16 genera and 8 families (Caeciliidae, Bufonidae, Cycloramphidae, Hylidae, Brachycephalidae, Leiuperidae, Leptodactylidae, and Microhylidae), and 45 species of reptiles belonging to 38 genera and 16 families (Amphisbaenidae, Anguidae, Gekkonidae, Gymnophthalmidae, Polychrotidae, Scincidae, Teiidae, Tropiduridae, Anomalepididae, Leptotyphlopidae, Typhlopidae, Boidae, Colubridae, Dipsadidae, Elapidae, and Viperidae).

Introduction

About 5,450 amphibian species are currently known in the world (Frost 2008) with approximately 15% of these species occurring within Brazilian territory (SBH 2008a). These numbers put Brazil in the first place related to countries with high diversity of amphibians. As to reptiles it is believed to exist up to 10,400 species in the world (Zug et al. 2001) with about 700 described for Brazil (SBH 2008b). The Cerrado is one of the most interesting tropical habitats related to species diversity patterns. The central location of this biome related to other Brazilian biomes favors a high regional diversity of species (MMA 2002). Despite several recent studies, amphibians and reptiles of the Cerrado are still poorly known or properly documented. Basic information on natural history, composition and structure of amphibian and reptile communities of the Cerrado are limited and mostly related to areas close to anthropic occupation, roads or rivers, reflecting the colonization history of the region (Dias 1994; Duellman 1999; Silva Jr. et al. 2005).

If we consider the actual rate of deforestation and high endemism of Cerrado (Colli et al. 2002) this ecosystem is still poorly represented in published faunal inventories. The filling of hydroelectric power plant reservoirs, despite the enormous environmental impacts, can generate unique opportunities to improve the knowledge of regional herpetofauna within the affected area. This study is the result of the faunal rescue operation of the small hydroelectric power plants Santa Edwiges I and II, on the northeastern state of Goiás.

Materials e Methods

The small hydroelectric power plant (PCH) Santa Edwiges II is located on Buritis River (14°21'15" S and 46°11'40" W) and PCH Santa Edwiges I is located on Piracanjuba River (14°18'32" S and 46°10'25" W). Piracanjuba River is a tributary of the Buritis River and the latter is a tributary of the right margin of the Correntes River (upper Tocantins River valley), on the border of the municipalities of Mambai and Buritinópolis, state of Goiás, Brazil. The distance between these

LISTS OF SPECIES

power plants (from north to south in straight line) is about 6 km. (Figure 1). The rescue activities at PCH Santa Edwiges II were carried out between 31 August and 29 September 2005 (29 days) and at PCH Santa Edwiges I between 30 July and 12 September 2006 (45 days). Collecting efforts comprised of daily surveys of the reservoirs, in trees, shrubs, islets, and rock outcrops using herpetological hooks, laces and nets. Specimens were placed in plastic vials or bags, cloth bags, with individual collecting data. Collecting activities were legally permitted according to permits # 024/2005 (Process 5601.27577/2005-2) (PCH Santa Edwiges II) and permit # 028/2006 (Process 5601.07758/2006-4) (PCH Santa Edwiges I) from *Agência Goiana de Meio Ambiente* (AGMA).

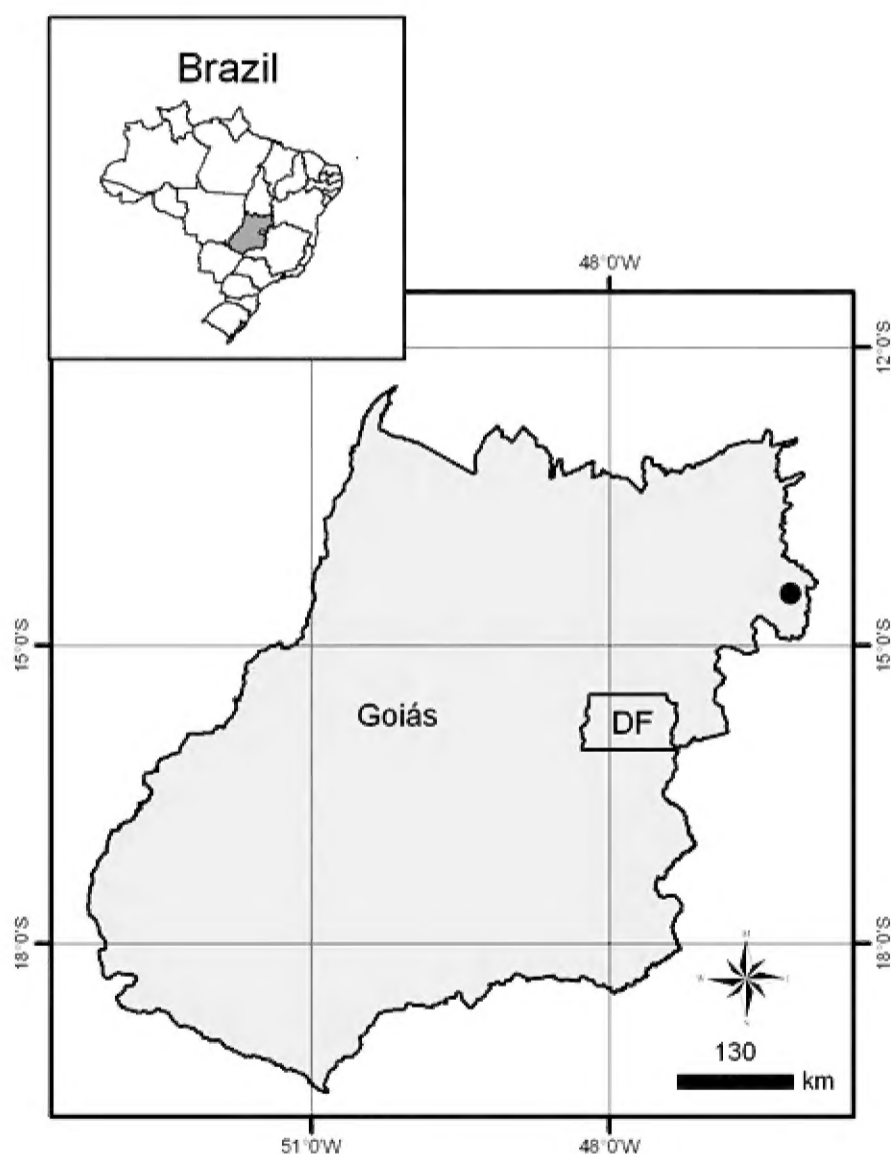


Figure 1. Location of PCHs Santa Edwiges I and II in the state of Goiás.

Owing to the short distance between these power plants we treated the results as a combined faunal list (Santa Edwiges I/II). All collected specimens were deposited at the herpetological collection of the *Museu de Zoologia of the Universidade de São*

Paulo (MZUSP) and the *Centro de Estudos e Pesquisas Biológicas* (CEPB) of the *Universidade Católica de Goiás* (Appendix).

Results and Discussion

The site of Santa Edwiges II presented nine species of amphibians and 18 species of reptiles but all were included in the list of 30 species of amphibians and 45 species of reptiles of Santa Edwiges I (total of 75 species), therefore herpetofauna of both sites are treated together as Santa Edwiges I/II.

Amphibians were represented by two orders, eight families, 16 genera, and 30 species. The order Anura contributed with seven families, 15 genera, and 29 species, and the order Gymnophiona with one family, one genus, and one species. The families with higher species numbers were Hylidae and Leiuperidae with 14 and five species respectively, followed by Leptodactylidae (four species), Bufonidae and Microhylidae (two species), and Brachycephalidae, Cycloramphidae and Caeciliidae (one species). The higher number of hylids is a known characteristic already described by other authors for the Neotropical region. Hylids (frogs) are adapted to an arboreal habit enabling them to successfully occupy environments with high structural heterogeneity (Cardoso et al. 1989) as the phytogeographies of the Cerrado-Caatinga ecotone. Reptiles were represented by the order Squamata, with 16 families, 38 genera, and 45 species. Amphisbaenians contributed with one family, three genera, and three species. Lizards contributed with seven families, 12 genera, and 14 species, with snakes represented by eight families, 23 genera, and 28 species (Table 1).

The species recorded in this study were analyzed and compared with other reports of faunal distribution on the five Brazilian ecosystems, with Frost (2008) and Bastos et al. (2003) for amphibians, and Colli et al. (2002), Silva Jr. and Sites (1995), and Pavan (1999) for reptiles. The morphoclimatic and phytogeographic conditions of the Cerrado make possible ample contact zones with the remaining ecosystems therefore transforming it in a faunal confluence of several origins.

LISTS OF SPECIES

The record of *Hypsiboas crepitans* (Figure 2A) and *Leposternon polystegum* (Figure 2K) are indicative of the contact between Cerrado and Caatinga. *Phyllomedusa azurea* (Figure 2C), *Hypsiboas lundii* (Figure 2D), *Barycholos ternetzi* (Figure 2F), *Cercolophia roberti* (Figure 2L), and *Liophis maryellenae* (Figure 2M) are restricted to Cerrado. However, most of the recorded species present a wide distribution in open areas of Brazil, such as *Leptodactylus mystacinus* (Figure 2B), *Hypsiboas albopunctatus* (Figure 2E), *Tupinambis merianae* (Figure 2G), *Micrablepharus maximiliani* (Figure 2H), *Polychrus acutirostris* (Figure 2I), *Amphisbaena alba* (Figure 2J), and *Bothrops moojeni* (Figure 2O), and one exotic species (*Hemidactylus mabouia*). One new species of *Cnemidophorus* is currently being described. Additional data include the newly described species of *Trachycephalus mambaiensis* (Cintra et al., 2009), and a new geographical distribution

record for the Brazilian coralsnake *Micrurus brasiliensis* (Figure 2N) (Silva Jr. 2007).

Cana Brava presented 41 species of amphibians and 78 of reptiles (total of 118 species) and Serra da Mesa presented 34 species of amphibians and 89 species of reptiles (total of 122 species) (Silva Jr. et al. 2005; Silva Jr. 2007). In a comparative analysis there is a higher similarity in species composition between Serra da Mesa and Cana Brava possibly due to the proximity of these sites (reservoirs are contiguous and there are similar physical and vegetational characteristics) as demonstrated by 141 species (amphibians and reptiles) in common. Despite this similarity there are 32 exclusive species for Cana Brava and 86 for Serra da Mesa. Since these data come from faunal rescue operations, the discrepancies in number of species might be partly related to flooded area and collecting efforts.

Table 1. Amphibians and reptiles recorded in the region affected by PCHs Santa Edwiges I and II (municipality of Mambai, state of Goiás, Brazil).

CLASS/ORDER/FAMILY	SPECIES
AMPHIBIA	
GYMNOPHIONA	
Caeciliidae	<i>Siphonops paulensis</i> Boettger, 1892
ANURA	
Bufonidae	<i>Rhinella granulosa</i> Spix, 1824 <i>Rhinella schneideri</i> (Werner, 1894)
Cycloramphidae	<i>Proceratophrys cristiceps</i> (Muller, 1884)
Hylidae	<i>Dendropsophus anataliasiasi</i> (Bokermann, 1962) <i>Dendropsophus minutus</i> (Peters, 1872) <i>Dendropsophus nanus</i> (Boulenger, 1889) <i>Hypsiboas albopunctatus</i> (Spix, 1824) <i>Hypsiboas crepitans</i> (Wied-Neuwied, 1824) <i>Hypsiboas lundii</i> (Burmeister, 1856) <i>Hypsiboas raniceps</i> Cope, 1862 <i>Pseudis bolbodactyla</i> A. Lutz, 1925 <i>Scinax fuscomarginatus</i> (A. Lutz, 1925) <i>Scinax fuscovarius</i> (A. Lutz, 1925) <i>Scinax similis</i> (Cochran, 1952) <i>Scinax gr. ruber</i> (Laurenti, 1768) <i>Trachycephalus mambaiensis</i> Cintra, Silva, Silva Jr, Garcia & Zaher, 2009
Brachycephalidae	<i>Phyllomedusa azurea</i> (Cope, 1962)
Leiuperidae	<i>Barycholos ternetzi</i> (Miranda-Ribeiro, 1937) <i>Eupemphix nattereri</i> (Steindachner, 1863) <i>Physalaemus centralis</i> Bokermann, 1962 <i>Physalaemus cuvieri</i> Fitzinger, 1826 <i>Pseudopaludicola falcipes</i> (Hensel, 1867)



LISTS OF SPECIES

CLASS/ORDER/FAMILY	SPECIES
Leptodactylidae	<i>Pseudopaludicola mystacalis</i> (Cope, 1887) <i>Leptodactylus furnarius</i> Sazima & Bokermann, 1978 <i>Leptodactylus fuscus</i> (Schneider, 1799) <i>Leptodactylus mystacinus</i> (Burmeister, 1861) <i>Leptodactylus ocellatus</i> (Linnaeus, 1758)
Microhylidae	<i>Dermatonotus muelleri</i> (Boettger, 1885) <i>Elachistocleis ovalis</i> Schneider, 1799
REPTILIA	
SQUAMATA	
Amphisbaenidae	<i>Amphisbaena alba</i> Linnaeus, 1758 <i>Cercolophia roberti</i> (Gans, 1964) <i>Leposternon polystegum</i> (Duméril, 1851)
Anguidae	<i>Ophiodes striatus</i> (Spix, 1824)
Gekkonidae	<i>Hemidactylus mabouia</i> (Moreau de Jonnès, 1818)
Gymnophthalmidae	<i>Cercosaura schreibersii</i> Wiegmann, 1834 <i>Colobosaura modesta</i> (Reinhardt & Lütken, 1862) <i>Micrablepharus maximiliani</i> (Reinhardt & Lütken, 1862)
Polychrotidae	<i>Anolis meridionalis</i> Boettger, 1885 <i>Polychrus acutirostris</i> Spix, 1825
Scincidae	<i>Mabuya heathi</i> Schmidt & Inger, 1951 <i>Mabuya nigropunctata</i> (Spix, 1825)
Teiidae	<i>Ameiva ameiva</i> (Linnaeus, 1758) <i>Cnemidophorus</i> sp. <i>Tupinambis merianae</i> (Duméril & Bibron, 1839)
Tropiduridae	<i>Tropidurus oreadicus</i> Rodrigues, 1987 <i>Tropidurus torquatus</i> (Wied, 1820)
Anomalepididae	<i>Liotyphlops beui</i> (Amaral, 1924)
Leptotyphlopidae	<i>Leptotyphlops koppesi</i> Amaral, 1955
Typhlopidae	<i>Typhlops brongersmianus</i> Vanzolini, 1976
Boidae	<i>Boa constrictor</i> Linnaeus, 1758 <i>Epicrates cenchria</i> (Linnaeus, 1758) <i>Eunectes murinus</i> (Linnaeus, 1758)
Colubridae	<i>Chironius flavolineatus</i> (Boettger, 1885) <i>Drymarchon corais</i> (Boie, 1827) <i>Spilotes pullatus</i> (Linnaeus, 1758) <i>Tantilla melanocephala</i> (Linnaeus, 1758)
Dipsadidae	<i>Apostolepis ammodites</i> Ferrarezzi, Barbo & Albuquerque, 2005 <i>Echinanthera occipitalis</i> (Jan, 1863) <i>Leptodeira annulata</i> (Linnaeus, 1758) <i>Liophis maryellenae</i> Dixon, 1985 <i>Liophis poecilogyrus</i> (Wied, 1824) <i>Liophis reginae</i> (Linnaeus, 1758) <i>Lygophis meridionalis</i> (Schenkel, 1901) <i>Oxyrhopus guibei</i> Hoge & Romano, 1977 <i>Philodryas olfersii</i> (Lichtenstein, 1823) <i>Philodryas patagoniensis</i> (Girard, 1857) <i>Pseudoboa nigra</i> (Duméril, Bibron & Duméril, 1854) <i>Sibynomorphus mikanii</i> (Schlegel, 1837) <i>Sibynomorphus</i> cf. <i>neuwiedi</i> (Ihering, 1911) <i>Thamnodynastes strigatus</i> (Günther, 1858) <i>Xenodon merremii</i> (Wagler, 1824)
Elapidae	<i>Micrurus brasiliensis</i> Roze, 1967
Viperidae	<i>Bothrops moojeni</i> Hoge, 1966 <i>Bothrops neuwiedi</i> Wagler, 1824

LISTS OF SPECIES

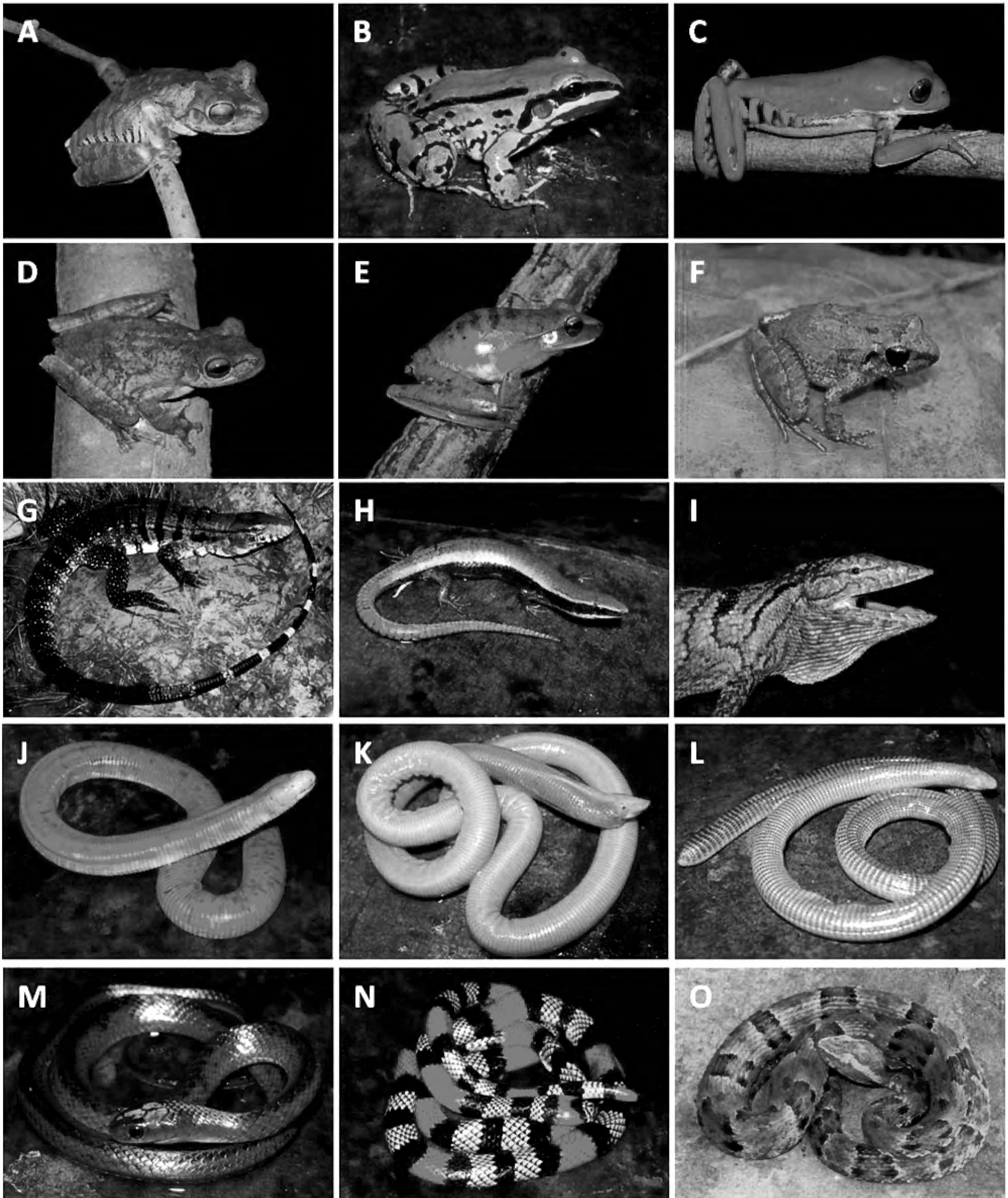


Figure 2. Representative species of amphibians and reptiles from PCHs Santa Edwiges I and II. A. *Hypsiboas crepitans*; B. *Leptodactylus mystacinus*; C. *Phyllomedusa azurea*; D. *Hypsiboas lundii*; E. *Hypsiboas albopunctatus*; F. *Barycholos ternetzi*; G. *Tupinambis merianae*; H. *Micrablepharus maximiliani*; I. *Polychrus acutirostris*; J. *Amphisbaena alba*; K. *Leposternon polystegum*; L. *Cercolophia roberti*; M. *Liophis maryellenae*; N. *Micrurus brasiliensis*; O. *Bothrops moojeni*.

LISTS OF SPECIES

Acknowledgements

We are indebted to the collecting staff at the rescue operations of PCHs Santa Edwiges I and II. We thank Carolina Castro-Mello, Mauricio Forlani da Cruz, Juan Camilo Arredondo for curatorial help at MZUSP.

Literature cited

- Bastos, R. P., J. A. O. Mota, L. P. Ávila, and L. D. Guimarães. 2003. Anfíbios da Floresta Nacional de Silvânia, Estado de Goiás. Goiânia, Secretaria do Meio Ambiente e dos Recursos Hídricos/Fundo Estadual do Meio Ambiente. Estado de Goiás. 82 p.
- Colli, G. R., R. P. Bastos and A. F. B. Araújo. 2002. The character and dynamics of the Cerrado herpetofauna; p. 223-241 *In* P. S. Oliveira and R. J. Marquis (ed.). The Cerrados of Brazil: Ecology and Natural History of a Neotropical Savanna. New York. Columbia University Press.
- Cintra, C. E. D., H. L. R. Silva, N. J. Silva Jr., P. C. A. Garcia and H. Zaher. 2009. A new species of *Trachycephalus* (Amphibia, Anura, Hylidae) from the State of Goiás, Brazil. *Zootaxa* 1975:58-68.
- Dias, B. F. S. 1994. A conservação da natureza; p. 607-663 *In* Cerrado: caracterização, ocupação e perspectivas. M. N. Pinto (org.). 2a edição. Brasília. Editora Universidade de Brasília.
- Duellman, W. E. 1999. Distribution patterns of amphibians in South America; p. 255-327 *In* W. E. Duellman (ed.). Patterns of Distribution of Amphibians. Baltimore. The Johns Hopkins University Press. 633 p.
- Frost, W. D. 2008. Amphibians species of the world. Database accessible at <http://research.amnh.org/herpetology/amphibia/>. American Museum of Natural History, New York, USA. Captured on 20 April 2008.
- MMA. 2002. Biodiversidade brasileira: avaliação e identificação de áreas e ações prioritárias para conservação, utilização sustentável e repartição de benefícios da biodiversidade brasileira. Brasília. Ministério do Meio Ambiente. 404p.
- Pavan, D. 1999. Considerações ecológicas sobre a fauna de sapos e lagartos de uma área de Cerrado brasileiro sob o impacto do enchimento do reservatório de Serra da Mesa. Dissertação de Mestrado. Instituto de Biociências. São Paulo. Universidade de São Paulo. 159 p.
- SBH – Sociedade Brasileira de Herpetologia. 2008a. Lista de espécies de anfíbios do Brasil. Sociedade Brasileira de Herpetologia (SBH). Database accessible at <http://www.sbherpetologia.org.br/checklist/anfibios.htm>. Captured on April 2008.
- SBH – Sociedade Brasileira de Herpetologia. 2008b. Lista de espécies de répteis do Brasil. Sociedade Brasileira de Herpetologia (SBH). Database accessible at <http://www2.sbherpetologia.org.br/checklist/repteis.htm>. Captured on April 2008.
- Silva Jr., N. J. 2007. Novas ocorrências de *Micrurus brasiliensis* Roze, 1967 (Serpentes: Elapidae) em áreas de tensão ambiental no Centro-oeste brasileiro. *Estudos* 34(11/12):931-956.
- Silva Jr., N. J., H. L. R. Silva, M. T. U. Rodrigues, N. C. Valle, M. C. Costa, S. P. Castro, E. T. Linder, C. Johansson and J. W. Sites Jr. 2005. A fauna de vertebrados do alto rio Tocantins em áreas de usinas hidrelétricas. *Estudos* 32(1): 57-101.
- Silva Jr., N. J. and J. W. Sites, Jr. 1995. Patterns of Diversity of Neotropical squamate reptile species, with emphasis on the Brazilian Amazon and the conservation potential of indigenous reserves. *Conservation Biology* 9(4): 873-901.
- Zug, G. R., L. J. Vitt and J. P. Caldwell. 2001. Herpetology: An introductory Biology of Amphibians and Reptiles. San Diego. Academic Press. 630pp.

Received August 2008

Accepted July 2009

Published online September 2009

LISTS OF SPECIES

Appendix: Voucher specimens.

STATE OF GOIÁS, MUNICIPALITY OF MAMBAÍ, PCH SANTA EDWIGES I.

Amphibia: *Rhinella schneideri* (MZUSP 141535 – 38); *Dendropsophus minutus* (MZUSP 141540 – 44); *Hypsiboas albopunctatus* (MZUSP 141547); *Hypsiboas crepitans* (MZUSP 141572 – 80); *Hypsiboas lundii* (MZUSP 141584 – 85); *Hypsiboas raniceps* (MZUSP 141498 – 06); *Phyllomedusa azurea* (MZUSP 141513 – 14); *Pseudis bolbodactyla* (MZUSP 141517 – 21); *Scinax fuscovarius* (MZUSP 141528 – 29); *Scinax* gr. *ruber* (MZUSP 141531 – 32); *Trachycephalus mambaiensis* (MZUSP 135713 – 17); *Leptodactylus furnarius* (MZUSP 141507); *Leptodactylus ocellatus* (MZUSP 141508 – 12); *Physalaemus centralis* (MZUSP 141516); *Pseudopaludicola falcipes* (MZUSP 141522 – 26); *Pseudopaludicola mystacalis* (MZUSP 141527); *Siphonops paulensis* (MZUSP 141533 – 34).

Reptilia: *Amphisbaena alba* (MZUSP 99188 – 89); *Apostolepis ammodites* (MZUSP 17781); *Bothrops neuwiedi* (MZUSP 16729 – 31); *Cnemidophorus* sp. (MZUSP 95637 – 38); *Cercolophia roberti* (MZUSP 95639); *Cercosaura schreibersii* (MZUSP 99177 – 86); *Chironius flavolineatus* (MZUSP 17767 – 68); *Colobosaura modesta* (MZUSP 99123); *Leposternon polystegum* (MZUSP 99189 – 97); *Leptodeira annulata* (MZUSP 17763 – 66); *Leptotyphlops koppesi* (MZUSP 17761 – 62); *Liophis maryellenae* (MZUSP 15120 – 23); *Liotyphlops beui* (MZUSP 15117 – 18); *Lygophis meridionalis* (MZUSP 17783); *Mabuya heathi* (MZUSP 99122); *Mabuya nigropunctata* (MZUSP 99128 – 30); *Philodryas patagoniensis* (MZUSP 17773); *Sibynomorphus* cf. *neuwiedi* (MZUSP 16728); *Tantilla melanocephala* (MZUSP 17774); *Thamnodynastes strigatus* (MZUSP 17775); *Tropidurus oreadicus* (MZUSP 99228); *Tropidurus torquatus* (MZUSP 99229 – 30); *Typhlops brongersmianus* (MZUSP 17776 – 80); *Micrurus brasiliensis* (MZUSP 15119).

STATE OF GOIÁS, MUNICIPALITY OF BURITINÓPOLIS, PCH SANTA EDWIGES II.

Amphibia: *Rhinella granulosa* (CEPB 3333); *Rhinella schneideri* (MZUSP 141539); *Proceratophrys cristiceps* (CEPB 3334); *Dendropsophus anataliasiasi* (CEPB 3233); *Dendropsophus minutus* (MZUSP 141545 – 46); *Dendropsophus nanus* (CEPB 3234); *Hypsiboas albopunctatus* (MZUSP 141548 – 71); *Hypsiboas crepitans* (MZUSP 141581 – 83); *Hypsiboas lundii* (MZUSP 141586 – 06); *Hypsiboas raniceps* (MZUSP 141607 – 22); *Phyllomedusa azurea* (MZUSP 141515); *Scinax fuscovarius* (MZUSP 141530); *Scinax similis* (CEPB 3232); *Barycholos ternetzi* (MZUSP 141623); *Eupemphix nattereri* (CEPB 3231); *Physalaemus cuvieri* (CEPB 3230); *Leptodactylus fuscus* (CEPB 3229); *Leptodactylus martinezi* (MZUSP 141625 – 26); *Leptodactylus mystacinus* (CEPB 3228); *Elachistocleis ovalis* (CEPB 3227); *Dermatonotus muelleri* (MZUSP 141624).

Reptilia: *Ameiva ameiva* (MZUSP 99146 – 62); *Anolis meridionalis* (MZUSP 99163 – 68); *Bothrops moojeni* (MZUSP 17786); *Cercosaura schreibersii* (MZUSP 99169 – 76); *Chironius flavolineatus* (MZUSP 17769 – 70); *Colobosaura modesta* (MZUSP 99124 – 26); *Epicrates cenchria* (MZUSP 17784); *Hemidactylus mabouia* (MZUSP 99231); *Leposternon polystegum* (MZUSP 99198); *Liophis poecilogyrus* (CEPB 1118); *Liophis reginae* (MZUSP 17789); *Lygophis meridionalis* (MZUSP 17782); *Mabuya nigropunctata* (MZUSP 99131 – 45); *Micrablepharus maximiliani* (MZUSP 99201); *Ophiodes striatus* (MZUSP 99199 – 200); *Oxyrhopus guibei* (MZUSP 17772); *Philodryas olfersii* (MZUSP 17787); *Polychrus acutirostris* (MZUSP 99202 – 20); *Pseudoboa nigra* (CEPB 1119); *Sibynomophus mikani* (MZUSP 17788); *Tropidurus oreadicus* (MZUSP 99221 – 22); *Tropidurus torquatus* (MZUSP 99223 – 27); *Xenodon merremii* (MZUSP 17785).